



Knowledge and Attitude towards Vitamin D Deficiency in Ha'il Region: A Community-Based Study

Abdelmuhsin Omer Ahmed Hassan¹, Khalid Farhan Alshammari¹, Abdulrahman Ahmed Alkhateeb¹, Abdullah Dawas Altamimi¹, Abdulaziz Khalid Al Shammari¹, Mohammed Salem Alharbi¹, Sumayyah Mohammad Almarshedy¹ and Hussain Gadelkarim Ahmed^{2,3*}

¹ Department of Internal Medicine, College of Medicine, University of Ha'il, Saudi Arabia

² Department of Pathology, College of Medicine, University of Ha'il, Saudi Arabia

³ Department of Histopathology and Cytology, FMLS, University of Khartoum, Sudan

*Corresponding e-mail: am.hassan@uoh.edu.sa

ABSTRACT

Background: Vitamin D deficiency represents a major health problem in Saudi Arabia. Therefore, this study aimed to assess the Knowledge and attitude towards vitamin D deficiency in Ha'il Region (Northern Saudi Arabia). **Methodology:** A total of 500 Saudi volunteers living in the city of Ha'il and surrounding towns were included during the period from January 2020 to March 2020. Adults aged 15 years or older were randomly selected regardless of gender, occupation or marital status. **Results:** Out of the 500 study subjects, 214 (42.8%) did previous vitamin D testing (72/207 (34.8%) males and 142/293 (48.5%) were females). Females were significantly better for testing their vitamin D status than males ($p=0.0032$). **Conclusion:** Vitamin D deficiency is highly prevalent in Ha'il Region. Although there is a relatively higher awareness level towards vitamin D sources, vitamin D testing, as well as knowledge about vitamin D deficiency-related disorders are poor among Saudi living in Ha'il Region.

Keywords: Vitamin D, Saudi Arabia, Ha'il region, Osteoporosis, Osteoarthritis, Musculoskeletal disease

INTRODUCTION

Worldwide, more than one billion persons are suffering from vitamin D deficiency. Vitamin D production in the skin requires ultraviolet-B, which is gained by Sunlight exposure. The modern lifestyle with reduced outdoor activities is the major factor preventing exposure to sunlight resulting in vitamin D deficiency [1]. In addition to poor intake of food containing vitamin D [2]. Several foods varieties have been documented to supply vitamin D including butter, fish [3], milk product [4], eggs [5], etc.

Vitamin D deficiency has been linked to multifarious pathological conditions resulting in an increased risk of mortality in the general population worldwide [6]. Besides, skeletal muscles [7], bones, and joints diseases [8]. Vitamin D deficiency can cause, connective tissue disorders, type 2 diabetes (T2DM), cardiovascular diseases (CVDs), inflammatory bowel disorders, autoimmune diseases, neurological diseases, depression, cancer, and others [6,9].

Vitamin D deficiency represents a major health problem in Saudi Arabia. The prevalence of vitamin D deficiency across all Saudi community was reported to be 81% [10]. Studies from Saudi Arabia have reported that the prevalence of vitamin D deficiency is rather more prominent among women compared to men [11]. This problem increased the risk of several diseases in the Saudi population. High prevalence rates of osteoporosis, osteopenia, and osteoarthritis were reported from Saudi Arabia [12,13].

Studies from Saudi Arabia showing that the increased prevalence rates of vitamin D among the Saudi population are associated with low levels of knowledge and awareness towards vitamin D deficiency associated issues, as well as,

their attitude towards vitamin D complementary. It was shown that there was a significant association between levels of education vitamin D status [14]. Consequently, there is a crucial need for efforts to increase the awareness levels towards the tragedy of the vitamin D deficiency epidemic in different regions of Saudi Arabia. Therefore, this study aimed to assess the Knowledge and attitude towards vitamin D deficiency in Ha'il Region (Northern Saudi Arabia).

MATERIALS AND METHODS

This was a descriptive cross-sectional study, conducted in the Ha'il region (Northern Saudi Arabia). Data were obtained from the general Saudi population. Adults aged 15 years or older were randomly selected regardless of gender, occupation or marital status. A purposeful questionnaire was thoughtfully deliberated and used to collect the data. Each participant was interviewed to fulfill the variables including age, gender, symptoms of vitamin D deficiency, level of vitamin D (vitamin D deficiency defined as vitamin D level less than 20 ng/ml), treatment, and impact of vitamin D on the body and relation to diseases. A total of 500 Saudi volunteers living in the city of Ha'il and surrounding towns were included during the period from January 2020 to March 2020.

Ethical Consent

Ethical approval for this study was obtained from the ethical committee of the College of Medicine, University of Ha'il. All measures included in the current study comply with ethical standards of the 1964 Helsinki declaration, as well as, its related subsequent modifications. Ethical approval number: HREC 00113/CM-UOH.04/20.

Statistical Analysis

Variables entered a computer software SPSS. Frequencies, percentages, and statistical values considering 95% confidence interval were calculated. Chi-square test was calculated, a p-value of less than 0.05 considered statistically significant.

RESULTS

This study investigated 500 volunteers, aged from 15 to 67 years old with a mean age of 29 years, including 207 (41.4%) males and 293 (58.6%) females; giving males' females ratio of 1.00:1.42. The majority of the study subjects were at age range 21-25 years followed by age groups 26-35 and ≤ 20 years, constituting 145/500 (29%), 127/500 (25.4%), and 105/500 (21%), respectively. The majority of males were at age group 21-25 years followed by age range ≤ 20 years, representing 70/207 (33.8%) and 51/207 (24.6%), respectively, whereas, the majority of females were seen in the age group 26-35 years followed by 21-25 years constituting 80/293 (27.3%) and 75/293 (25.6%), respectively, as indicated in Table 1 and Figure 1. Most of the study subjects were students followed by employees, constituting 219/500 (43.8%) and 176/500 (35.2%), in this order, as indicated in Table 1 and Figure 1. The social status was indicated in Table 1.

Table 1 Distribution of the study population by demographical characteristics

| Variable | Males (N=207) | Females (N=293) | Total (N=500) |
|-------------------|---------------|-----------------|---------------|
| Age | | | |
| ≤ 20 years | 51 | 54 | 105 |
| 21-25 | 70 | 75 | 145 |
| 26-35 | 47 | 80 | 127 |
| 36-45 | 24 | 50 | 74 |
| ≥ 46 | 15 | 34 | 49 |
| Occupation | | | |
| Self-employed | 12 | 74 | 86 |
| Students | 103 | 116 | 219 |
| Employees | 85 | 91 | 176 |

| | | | |
|----------------------|-----|-----|-----|
| Retired | 7 | 12 | 19 |
| Social Status | | | |
| Single | 137 | 148 | 285 |
| Married | 68 | 126 | 194 |
| Divorced | 1 | 12 | 13 |
| Widowed | 1 | 7 | 8 |



Figure 1 Study population by demographical characteristics

Out of the 500 study subjects, 214 (42.8%) did previous vitamin D testing (72/207 (34.8%) males and 142/293 (48.5%) were females). Females were significantly better for testing their vitamin D status than males ($p=0.0032$). About 444/500 (88.8%) participants, “think that sunlight is an important source for vitamin D”. Out of 444 participants, 182/207 (88%) were males and 262/293 (89.4%) were females. Moreover, 375/500 (75%) persons, “think that we can get vitamin D from nutrients like milk products and oily fish”. Out of 375 study subjects, 146/207 (70.5%) were males and 229/293 (78.2%) were females (Table 2).

About 299 (59.8%), 133 (26.6%), and 68 (13.6%) used to spend a Sun-exposure of <2 hrs/week, 3-4 hrs/week, 5-7 hrs/week. Approximately 112/207 (54%) and 187/293 (63.8%) of males and females exposed to the Sun for <2 hrs/week. Females were significantly less exposed to the Sun than males. The relative risk (RR), and the 95% confidence interval (95%CI) was 1.1796 (1.0130 to 1.3735), $p=0.0335$.

Table 2 Distribution of the study population by knowledge and source of vitamin D

| Variable | Males (N=207) | Females (N=293) | Total (N=500) |
|--|---------------|-----------------|---------------|
| Have you been tested for vitamin D levels? | | | |
| Yes | 72 | 142 | 214 |
| No | 116 | 143 | 259 |
| Don't know | 19 | 8 | 27 |
| Do you think that sunlight is an important source of vitamin D? | | | |
| Yes | 182 | 262 | 444 |
| No | 6 | 8 | 14 |
| Don't know | 19 | 23 | 42 |
| Do you think that we can get vitamin D from nutrients like milk products and oily fish? | | | |

| | | | |
|--|-----|-----|-----|
| Yes | 146 | 229 | 375 |
| No | 20 | 19 | 39 |
| Don't know | 41 | 45 | 86 |
| How many average hours per week did you spend for healthy sun exposure which defined as (in the winter from 10 am to 2 pm, and in the summer from 9 am to 10:30 pm) | | | |
| <2 hrs/week | 112 | 187 | 299 |
| 3-4 hrs/week | 56 | 77 | 133 |
| 5-7 hrs/week | 39 | 29 | 68 |

Table 3, summarized the distribution of the study population by knowledge and attitude towards vitamin D deficiency-related disorders. About 381/500 (76.2%) believed that bone pain can be caused by vitamin D deficiency. Out of 381 persons, 145/207 (70%) males and 236/293 (80.5%) were females. About 332/500 (66.4%) believed that joints pain can be caused by vitamin D deficiency. Out of 381 persons, 130/207 (62.8%) males and 202/293 (69%) were females. About 259/500 (51.8%) believed that vitamin D deficiency can cause musculoskeletal diseases. Out of 381 persons, 105/207 (50.7%) males and 154/293 (52.6%) were females. About 196/500 (39.2%) believed that vitamin D deficiency can cause diseases like (cardiovascular, diabetes, depression, hypercholesterolemia, cancer, and multiple sclerosis). Out of 381 persons, 83/207 (40%) males and 113/293 (38.6%) were females.

Table 3 Distribution of the study population by knowledge and attitude towards vitamin D deficiency-related disorders

| Variable | Males (N=207) | Females (N=293) | Total (N=500) |
|--|---------------|-----------------|---------------|
| Could bone pain be related to vitamin D deficiency? | | | |
| Yes | 145 | 236 | 381 |
| No | 9 | 8 | 17 |
| Don't know | 53 | 49 | 102 |
| Do joints pain could be related to vitamin D deficiency? | | | |
| Yes | 130 | 202 | 332 |
| No | 11 | 25 | 36 |
| Don't know | 66 | 66 | 132 |
| Could muscle pain be related to vitamin D deficiency? | | | |
| Yes | 91 | 169 | 260 |
| No | 32 | 40 | 72 |
| Don't know | 84 | 84 | 168 |
| Do you think that vitamin D deficiency is related to some musculoskeletal diseases? | | | |
| Yes | 105 | 154 | 259 |
| No | 19 | 26 | 45 |
| Don't know | 83 | 113 | 196 |
| Do you think that vitamin D deficiency is related to other diseases like cardiovascular, diabetes, depression, hypercholesterolemia, cancer and multiple sclerosis? | | | |
| Yes | 75 | 160 | 235 |
| No | 29 | 36 | 65 |
| Don't know | 103 | 97 | 200 |

Concerning the source of information about vitamin D, the great majority of participants got their information from doctors followed by social media, constituting 118 (23.6%) and 99 (19.8%), correspondingly. The distribution of males and females was relatively similar for most of the sources of information, with some variability when calculating the percentages within entire males or females, as shown in Table 4 and Figure 2.

Table 4 Source of information about vitamin D

| Source | Males (N=207) | Females (N=293) | Total (N=500) |
|-----------------------|---------------|-----------------|---------------|
| Doctors | 44 | 74 | 118 |
| Social Media | 35 | 64 | 99 |
| Relatives and friends | 34 | 42 | 76 |
| Self-search | 41 | 35 | 76 |
| Publications | 10 | 14 | 24 |
| Others | 43 | 64 | 107 |
| Total | 207 | 293 | 500 |

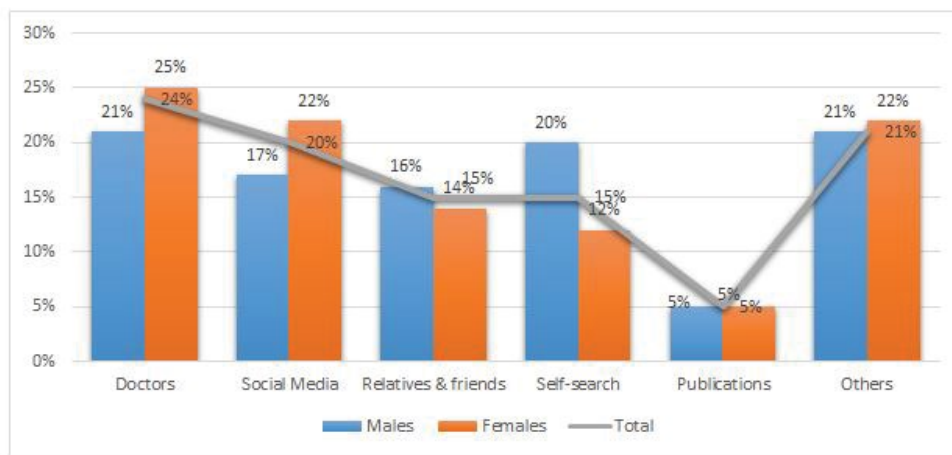


Figure 2 Description of the study population by the source of information about vitamin D

Table 5 and Figure 3 showing the distribution of the study population by age and attitude towards vitamin D. Most of persons did vitamin D testing were found in the age group 26-35 years followed 21-25 and 36-45 years, representing 63/214 (29.4%), 56/214 (26%), and 43/214 (20%), correspondingly. Percentages within an entire age group were shown in Figure 3.

Knowledge of the Sun source of vitamin D was increasingly reported by individuals in the age groups 21-25, 26-35, and ≤ 20 years, representing 136/444 (30.6%), 119/444 (26.8%), and 87/444 (19.6%), in this order. Percentages within an entire age group were shown in Figure 3.

Knowledge of the “vitamin D deficiency is related to some musculoskeletal diseases” was increasingly reported by participants in the age groups 21-25, ≤ 20, and 26-35 years, representing 97/259 (37.5%), 55/259 (21.2%), and 53/259 (20.5%), in this order. Percentages within an entire age group were shown in Figure 3.

Table 5 Distribution of the study subjects by age and attitude towards vitamin D

| Variable | ≤ 20 years | 21-25 | 26-35 | 36-45 | ≥ 46 | Total |
|--|------------|-------|-------|-------|------|-------|
| Have you been tested for vitamin D levels? | | | | | | |
| Yes | 22 | 56 | 63 | 43 | 30 | 214 |
| No | 72 | 84 | 59 | 28 | 16 | 259 |
| Don't know | 11 | 5 | 5 | 3 | 3 | 27 |
| Total | 105 | 145 | 127 | 74 | 49 | 500 |
| Do you think that sunlight is an important source of vitamin D? | | | | | | |

| | | | | | | |
|--|-----|-----|-----|----|----|-----|
| Yes | 87 | 136 | 119 | 65 | 37 | 444 |
| No | 3 | 4 | 0 | 5 | 2 | 14 |
| Don't know | 15 | 5 | 8 | 4 | 10 | 42 |
| Total | 105 | 145 | 127 | 74 | 49 | 500 |
| Do you think that vitamin D deficiency is related to some musculoskeletal diseases? | | | | | | |
| Yes | 55 | 97 | 53 | 35 | 19 | 259 |
| No | 9 | 8 | 14 | 7 | 7 | 45 |
| Don't know | 41 | 40 | 60 | 32 | 23 | 196 |
| Total | 105 | 145 | 127 | 74 | 49 | 500 |

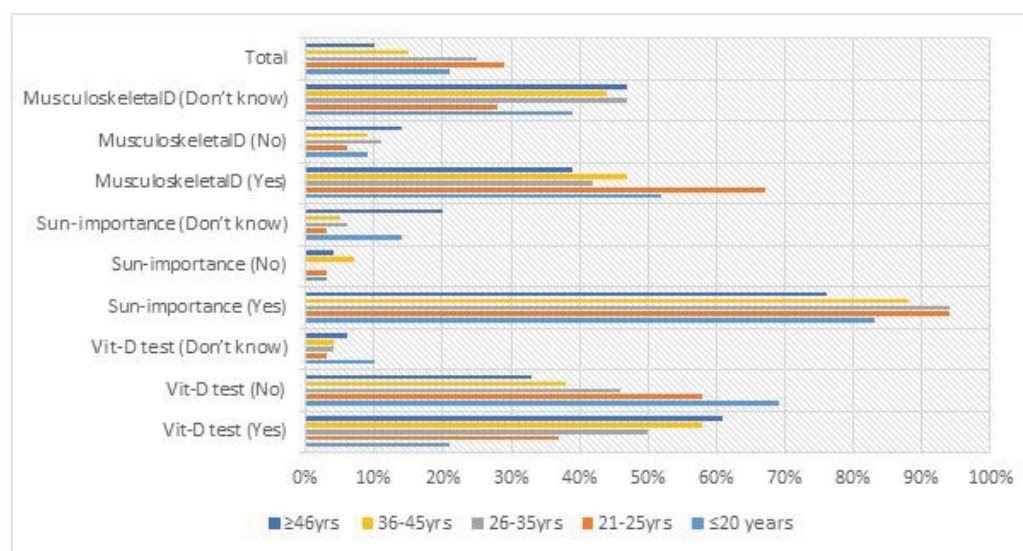


Figure 3 Study subjects by age and attitude towards vitamin D (Percentages within the entire age group)

DISCUSSION

As vitamin D deficiency is highly prevalent throughout Saudi Arabia, literature from each region of the country is deemed important to plan for better strategies to reduce the burden of vitamin D deficiency-related disorders. As a result, the current study was aimed to assess the Knowledge and attitude towards vitamin D deficiency in Ha'il Region (Northern Saudi Arabia).

Although studies from Saudi Arabia have shown that the prevalence rates of vitamin D deficiency are ranging from 70%-81% [10,15], the present study has revealed that only 42.8% of persons have tested themselves for possible vitamin D deficiency. Females were significantly better for testing their vitamin D status than males ($p=0.0032$). Studies from Saudi Arabia denote that females are more susceptible to conditions necessitating vitamin D investigation than males as women are less exposed to sunlight [16,17].

The present study showing that 88.8% of participants, "think that sunlight is an important source for vitamin D. Moreover, 70.5% of participants "think that we can get vitamin D from nutrients like milk products and oily fish". This indicates a high level of awareness, but practically it might not be applied by most of the population.

In this study, about 59.8%, 26.6%, and 13.6% used to spend a Sun-exposure of <2 hrs/week, 3-4 hrs/week, 5-7 hrs/week. Such values divulge the inadequate exposure of sunlight by most people. As modern diets representing a poor source of vitamin D, skin synthesis following sunlight exposure represent a major source of vitamin D. Type of skin (white, brown or black) determine the adequate time for sufficient sunlight exposure. White skin requires a short time

of sunlight exposure to meet vitamin D requirements [18]. The findings of the current study demote, females were significantly less exposed to the Sun than males ($p=0.0335$). Saudi females have very limited outdoor activities, besides some attitudes toward body exposure [19].

Participants' Knowledge about the interrelation between bone diseases (76.2%) and joint diseases (66.4%) was a mediocre call for further promotion. Moreover, 51.8% and 39.2% knew that vitamin D deficiency can cause musculoskeletal diseases and diseases such as (cardiovascular, diabetes, depression, hypercholesterolemia, cancer, and multiple sclerosis), respectively. This indicating a relatively low knowledge about vitamin D deficiency complications, which necessitate the importance of implementing a sustainable educational program covering the whole region. It was well established that vitamin D deficiency is responsible for diverse patterns of multifarious diseases [20,21].

Concerning the source of information about vitamin D, the great majority of participants got their information from doctors followed by social media, constituting 23.6% and 19.8%, correspondingly. This showing a resonant shortage in utilizing the miscellaneous sources of levitation the awareness towards health education, above all the means of social media.

With regard to the association between age and attitude toward vitamin D related factors, there were relatively similar understanding and attitude among all age groups with few exceptions, particularly when comparing the percentages within entire age groups, as signposted in Table 5 and Figure 3.

Though the present study makes available important information to establish an appropriate program to reduce the burden of vitamin D deficiency in the Ha'il Region, it has some limitations including its cross-sectional setting besides presentation of quantitative variables' measures.

CONCLUSION

Vitamin D deficiency is highly prevalent in Ha'il Region. Although there is a relatively higher awareness level towards vitamin D sources, vitamin D testing, as well as knowledge about vitamin D deficiency-related disorders are poor among Saudi living in Ha'il Region. Utilizing educational means such as social media may enhance the general population awareness toward vitamin D related health problems.

DECLARATIONS

Acknowledgment

The authors would like to thank all participants for their time and support.

Conflicts of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

REFERENCES

- [1] Nair, Rathish, and Arun Maseeh. "Vitamin D: The "sunshine" vitamin." *Journal of Pharmacology and Pharmacotherapeutics*, Vol. 3, No. 2, 2012, pp. 118-26.
- [2] Caccamo, Daniela, et al. "Health risks of hypovitaminosis D: A review of new molecular insights." *International Journal of Molecular Sciences*, Vol. 19, No. 3, 2018, p. 892.
- [3] Vaes, A. M. M., et al. "Food sources of vitamin D and their association with 25-hydroxyvitamin D status in Dutch older adults." *The Journal of Steroid Biochemistry and Molecular Biology*, Vol. 173, 2017, pp. 228-34.
- [4] Weir, R. R., et al. "Environmental and genetic factors influence the vitamin D content of cows' milk." *Proceedings of the Nutrition Society*, Vol. 76, No. 1, 2017, pp. 76-82.
- [5] Dunlop, Eleanor, et al. "Vitamin D3 and 25-hydroxyvitamin d3 content of retail white fish and eggs in Australia." *Nutrients*, Vol. 9, No. 7, 2017, p. 647.
- [6] Caccamo, Daniela, et al. "Health risks of hypovitaminosis D: A review of new molecular insights." *International*

- Journal of Molecular Sciences*, Vol. 19, No. 3, 2018, p. 892.
- [7] Dzik, Katarzyna Patrycja, and Jan Jacek Kaczor. "Mechanisms of vitamin D on skeletal muscle function: oxidative stress, energy metabolism and anabolic state." *European Journal of Applied Physiology*, Vol. 119, No. 4, 2019, pp. 825-39.
- [8] Michigami, Toshimi. "Skeletal mineralization: Mechanisms and diseases." *Annals of Pediatric Endocrinology and Metabolism*, Vol. 24, No. 4, 2019, p. 213.
- [9] Marino R., and Misra M. "Extra-skeletal effects of vitamin D." *Nutrients*, Vol. 11, No. 7, 2011, p. 1460.
- [10] Al-Daghri, Nasser M. "Vitamin D in Saudi Arabia: Prevalence, distribution and disease associations." *The Journal of Steroid Biochemistry and Molecular Biology*, Vol. 175, 2018, pp. 102-07.
- [11] Alzaheb, Riyadh A. "The prevalence of hypovitaminosis D and its associated risk factors among women of reproductive age in Saudi Arabia: A systematic review and meta-analysis." *Clinical Medicine Insights: Women's Health*, Vol. 11, 2018, pp. 1-19.
- [12] Sadat-Ali, Mir, et al. "An epidemiological analysis of the incidence of osteoporosis and osteoporosis-related fractures among the Saudi Arabian population." *Annals of Saudi Medicine*, Vol. 32, No. 6, 2012, pp. 637-41.
- [13] Al-Daghri, Nasser M., et al. "Vitamin D status correction in Saudi Arabia: An experts' consensus under the auspices of the European Society for Clinical and Economic Aspects of Osteoporosis, Osteoarthritis, and Musculoskeletal Diseases (ESCEO)." *Archives of Osteoporosis*, Vol. 12, No. 1, 2017, p. 1.
- [14] Alamoudi, Lujain H., et al. "Awareness of vitamin D deficiency among the general population in Jeddah, Saudi Arabia." *Journal of Nutrition and Metabolism*, 2019.
- [15] Al-Alyani, Haneen, et al. "Vitamin D deficiency in Saudi Arabians: A reality or simply hype: A meta-analysis (2008-2015)." *Journal of Family and Community Medicine*, Vol. 25, No. 1, 2018, pp. 1-4.
- [16] Al-Ajlan, Abdulrahman S. "Screening of coeliac disease in undetected adults and patients diagnosed with irritable bowel syndrome in Riyadh, Saudi Arabia." *Saudi Journal of Biological Sciences*, Vol. 23, No. 4, 2016, pp. 462-66.
- [17] Muhsen, Ibrahim N., et al. "Bone mineral density loss in patients with cirrhosis." *Saudi Journal of Gastroenterology: Official Journal of the Saudi Gastroenterology Association*, Vol. 24, No. 6, 2018, pp. 342-47.
- [18] Webb, Ann R., et al. "Colour counts: Sunlight and skin type as drivers of vitamin D deficiency at UK latitudes." *Nutrients*, Vol. 10, No. 4, 2018, p. 457.
- [19] Aljefree, Najlaa, Patricia Lee, and Faruk Ahmed. "Exploring knowledge and attitudes about vitamin D among adults in Saudi Arabia: A qualitative study." *Healthcare*, Vol. 5, No. 4, 2017, p. 76.
- [20] Berridge, Michael J. "Vitamin D deficiency accelerates ageing and age-related diseases: A novel hypothesis." *The Journal of Physiology*, Vol. 595, No. 22, 2017, pp. 6825-36.
- [21] Roth, Daniel E., et al. "Global prevalence and disease burden of vitamin D deficiency: A roadmap for action in low-and middle-income countries." *Annals of the New York Academy of Sciences*, Vol. 1430, No. 1, pp. 44-79.